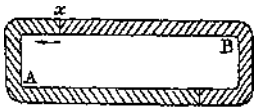
influence of contact amongst the metals, and such-like solid conductors [1] (797, 855). A very brief consideration is, I think, sufficient to show how little support these phenomena give to the theory in question.

1043. If the contact of metals exert any exciting influence in the voltaic circuit, then we can hardly doubt that thermo-electric currents are due to the same force; *i.e.* to disturbance, by local temperature, of the balanced forces of the different contacts in a metallic or similar circuit. Those who quote thermo effects as proofs of the effect of contact must, of course, admit this opinion.

1044. Admitting contact force, we may then assume that heat either increases or diminishes the electromotive force of contact. For if in fig. 79, A be antimony



and B bismuth, heat

applied at *x* causes a current to pass in the direction of the arrow; if it be assumed that bismuth in contact with antimony tends to become positive and the antimony negative, then heat diminishes the effect; but if it be supposed that the tendency of bismuth is to become negative, and of antimony positive, then heat increases the effect. How we are to decide which of these two views is the one to be adopted, does not seem to me clear; for nothing in the thermo-electric phenomena alone can settle the point by the galvanometer.

1045. If for that purpose we go to the voltaic circuit, there the situation of antimony and bismuth varies according as one or another fluid conductor is used (1000). Antimony, being negative to bismuth with the acids, is positive to it with an alkali or sulphuret of potassium; still we find they come *nearly together* in the midst of the metallic series. In the thermo series, on the contrary, their position is at the *extremes,* being as different or as much opposed to each other as they can be.

This difference was long ago pointed out by

Professor Gumming:[2]
how is it consistent with the contact
theory of the voltaic pile ?
1046. Again, if silver and antimony form
a thermo circle

[1] See Fechner's words.—Philosophical Magazine, 1838, xiii. p. 206.

[2] *Annals of Philosophy,* 1823, [VI]-[I]77-